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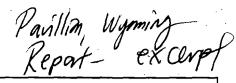


	
Table 4. Association of	f inorganic and organic anomalies with compounds used for hydraulic fracturing
ompound/ ompound@lass	ltiforanetion/from MSDSsend/WalkGompletion/Reports
)H	Information from MSDSs and Well Completion Reports KOH was used in a crosslinker (<5%) and in a solvent (85-100%). The formulation of fracture fluid provided for foam jobs typically consisted of CO ₂ , 6%
ζ, Cl	The formulation of fracture fluid provided for foam jobs typically consisted of CO ₂ , 6%
	KCI, 10% methanol, and "clean" fluid and "additives." Potassium metaborate was used
,	in crosslinkers (5-10%, 30-60%). KOH was used in a crosslinker (<5%) and in a solvent
	(85-100%).
1	Ammonium chloride was used in crosslinker (1-27%).
TEX	Aromatic solvent (typically BTEX mixture) was used in a breaker (<75%). Diesel oil
٠,	(mixture of saturated and aromatic hydrocarbons including naphthalenes and
	alkylbenzenes) was used in a guar polymer slurry/liquid gel concentrate (30-60%) and in
	a solvent (60-100%). Petroleum raffinates (mixture of paraffinic, cycloparaffinic,
	olefinic, and aromatic hydrocarbons) was used in a breaker (<30-60%). Heavy aromatic
ψ' ·	petroleum naptha (mixture of paraffinic, cycloparaffinic and aromatic hydrocarbons)
	was used in surfactants (5-10%, 10-30%, 30-60%) and in a solvent (10-50%). Toluene
•	was used in a flow enhancer (3-7%). Xylenes were used in a flow enhancer (40-70%) and
	a breaker (confidential percentage).
Trimethylbenzenes	1,2,4-trimethylbenzene was used in surfactants (0-1%). Diesel oil (mixture of saturated
	and aromatic hydrocarbons including naphthalenes and alkylbenzenes) was used in a
	guar polymer slurry/liquid gel concentrate (30-60%) and in a solvent (60-100%).
,	Petroleum raffinates (mixture of paraffinic, cycloparaffinic, olefinic, and aromatic
	hydrocarbons) was used in a breaker (<30-60%). Heavy aromatic petroleum naptha
	(mixture of paraffinic, cycloparaffinic and aromatic hydrocarbons) was used in
1000	surfactants (5-10%, 10-30%, 30-60%) and in a solvent (10-50%).
ORO and GRO	Diesel oil (mixture of saturated and aromatic hydrocarbons including naphthalenes and
	alkylbenzenes) was used in a guar polymer slurry/liquid gel concentrate (30-60%) and in
	a solvent (60-100%). Petroleum raffinates (mixture of paraffinic, cycloparaffinic, olefinic, and aromatic hydrocarbons) was used in a breaker (<30-60%). Heavy aromatic
	petroleum naptha (mixture of paraffinic, cycloparaffinic and aromatic hydrocarbons)
	was used in surfactants (5-10%, 10-30%, 30-60%) and in a solvent (10-50%).
laphthalene	Naphthalene was used in surfactants (0-1, 5-10%) and a breaker (confidential
apriciacie	percentage). Hydrotreated light petroleum distillates (mixture of C10-C14 naphthenes,
	iso- and n-paraffins) were used in a guar polymer slurry/liquid gel concentrate (40-60%).
	Diesel oil (mixture of saturated and aromatic hydrocarbons including naphthalenes and
	alkylbenzenes) was used in a guar polymer slurry/liquid gel concentrate (30-60%) and in
	a solvent (60-100%).
sopropanol	Isopropanol was used in a biocide (20-40%), in a surfactant (30-60%), in breakers (<1%,
,	10-30%), and in foaming agents (<3%, 1-5%, 10-30%).
ert-Butyl Alcohol	No MSDS listing. Breakdown product of methyl tert-butyl ether and tert-butyl
	hydroperoxide - found in gel breakers. See discussion.
ilycols	Diethylene glycol was used in a foaming agent (5-10%) and in a solvent (0.1-5%).
	Triethylene glycol was used in a solvent (95-100%).
-Butoxyethanol	2-butoxyethanol was used in a surfactant (10-30%), in foaming agents (<10%, <11%,
	<12%, 1-10%, 10-30%) and in solvents (15-40%, 60-100%).
cetone	Breakdown product of tert-butyl hydroperoxide - found in gel breakers. See discussion.
Benzoic Acid,	Natural breakdown products of organic contaminants (e.g., BTEX, glycols, etc.).
Acetate, Formate,	
actate, Propionate,	
2-Butanone, Phenols	